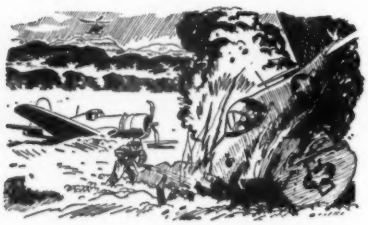
THE Johns Hopkins MAGAZINE

May 1952

SEE PAGE 1

IT WAS A BRIGHT EARLY DECEMBER DAY and Lieutenant Hudner was flying a Korean combat mission alongside another plane piloted by Ensign Jesse Brown. A burst of flak



caught the ensign's plane and he went spinning down, aflame. Lieutenant Hudner then deliberately crash landed near his flame-trapped shipmate. He radioed for help, after which he fought to keep the fire away from the fatally injured ensign until a rescue helicopter arrived. Today Lieutenant Hudner says:

"Maybe if America had been strong enough to discourage aggression two years ago, my friend, Jesse Brown, might be alive right now. So might thousands more of our Korea dead.

"For it's only too sadly true—today, in our world, weakness invites attack. And *peace is only for the strong.*

"Our present armed forces *are* strong—and growing stronger. But don't turn back the clock! Do your part toward *keeping* America's guard up by buying more . . . and more . . . and more United States Defense Bonds *now!* Back us up. And *together* we'll build the strong peace that all Americans desire!"

★ ★ ★

Remember that when you're buying bonds for defense, you're also building a personal reserve of savings. Remember, too, that if you don't save *regularly*, you generally don't save at all. So sign up today in the Payroll Savings Plan or the Bond-A-Month Plan. Buy United States Defense Bonds now!

Peace is for the strong...
Buy U. S. Defense Bonds now!

Lt. (jg) Thomas Hudner, Jr. U.S.N.

Medal of Honor

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THE Johns Hopkins MAGAZINE

VOLUME III May, 1952 NUMBER 8

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The Cover

How does the firefly make his light? Dr. William D. McElroy, the subject of this month's cover, is conducting research at Johns Hopkins which at last is uncovering the answer to this question. More than that, his studies are helping science to understand how all living things use energy. For details, see the picture story on Page 10.

Photograph by Werner Wolff

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THE JOHNS HOPKINS MAGAZINE is published monthly from October to June inclusive by the Johns Hopkins University, Baltimore 18, Maryland. Subscription, $1.00 per year; single copies, 15 cents. Entered as second-class matter at the Post Office at Baltimore, Maryland, under the Act of March 3, 1879. EDITORIAL OFFICE: The Johns Hopkins University, Baltimore 18, Maryland. ADVERTISING OFFICE: H. Addison Campbell, advertising manager, Room 1717, 505 Madison Avenue, New York 22, N. Y. Notice of change of address should reach the magazine at least thirty days before the publication date of the issue with which it is to take effect. When ordering a change of address, please enclose your present address label or a copy of it.

The New Authoritarianism

"A creeping paralysis has begun to infect our schools, our government, and the general public itself."

By GEORGE BOAS

I AM not one who is given to cries of alarm, who sees a crisis in every misdemeanor and the fabulous Dogs waiting at the end of the street for those who are going to them. And yet after thirty-five or forty years of teaching, I cannot but wonder whether the United States has learned much of anything from its great tradition of freedom and adventure, whether its statesmen are not almost eager to throw the traditions of their country into the sewer, and whether fear and hate have not taken the place of hope and charity in guiding the destinies of our culture.

Such despair may be only the fatigue of one who is no longer young and who lacks the strength to do much more fighting. We have survived for over a century and a half with our Constitution. We have developed a kind of civilization which every student of history knows to be unique. We are strong in material wealth, in inventiveness, and in national solidarity. The first is obvious and needs no elaboration by me. The second is paralleled by France and Great Britain. The third, while it sometimes expresses itself in a kind of childish chauvinism, nevertheless also expresses itself in a kind of friendliness and concern for others, in genuine brotherly love which is rare in the other countries which I happen to know.

A culture which has the traditions of solidarity

and the ability to meet new problems with new solutions, and which also has wealth, really has little to fear and no excuse for hate. But one sees on all sides a creeping paralysis which has begun to infect our schools, our government, and the general public itself. The first symptom of that disease is the return of authoritarianism.

By authoritarianism I mean the doctrine that in all fields of life there is a vested body of knowledge which is indisputable and which ought to be accepted as final. In religion this is revelation. In science it is the great body of natural laws. In government it is the constitution. In art it is usually the style of some master or group of masters represented by an academy. In common speech it is the dictionary. The authoritarian is the person who believes that all such rules of truth, beauty, and goodness are codified once and for all, and that there is a group of people who know what they are and whose knowledge ought to be asked for and followed when anyone is in doubt. Their opinion is never to be questioned. They form a sort of Supreme Court beyond which there is no appeal.

America is a country which turned away from that type of thinking in 1776. The moment when the colonists dared to challenge the authority of the British Parliament, they fomented revolution, un-British activities, and no pretty words spoken by their descendants in extenuation of their heresy can change that hard and presumably unpleasant fact. George Washington, Thomas Jefferson, Benjamin Franklin, even Charles Carroll of Carrollton were rebels, who not only sought to overthrow their lawful government by force and violence but actually did so. Any one of them could have been hanged as a traitor, had he been caught, and the law would have been observed.

That most of the signers of the Declaration of Independence were also gentlemen, in the English sense of that word, is also true. They had every reason, one might think, to follow tradition and pray that God send them a rational and wise monarch in the place of the madman from Hanover, waiting patiently until God see fit to do so. But the fact is that they did not so wait or pray. I shall not expatiate on what they did do; you know as well as I.

In contrast to authoritarianism is what one one might call the philosophy of individualism. In religion this comes down to freedom of conscience. A man reads the Bible and decides for himself what its message means; he does not go to the doctors to find out. If the Bible says, "Thou shalt not kill," he takes it seriously and determines for himself whether it is right to kill one's country's enemies, felons, Unitarians, monsters, and incurables. In science, this attitude is one of experimentation and personal investigation, seeing for oneself, checking up the conclusions of the past, Galileo against Aristotle, Pasteur against Bastian, Lavoisier against the Phlogistonists.

In government it is reinterpretation of the laws by the courts, and in the last analysis the willingness to admit that law has to change as the times change. In art it is the independents against the academicians. And in common speech it is all of us against the dictionary. Individualism of this sort was the dominant philosophy of America until very recent times. It was never the only philosophy, for no set of ideas ever captures a civilization in its entirety.

What evidence have we that the United States is moving rapidly towards authoritarianism?

Recently I was quoted in an editorial in an upstate New York (*Continued on Page 27*)

Dr. Boas is Professor of the History of Philosophy at Johns Hopkins. The accompanying article has been adapted from a speech made by Dr. Boas on April 8 as part of an informal course on the humanities and social sciences, presented by McCoy College before the Johns Hopkins Washington Alumni Association.

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Huge waves, driven by ocean storms, can smash sea walls, wreck anchored ships, and pound wharves and dock buildings to pieces. Above, an easterly gale lashes the dock area of a Scottish fishing town. To engineers, the pounding waves present the same problems of mechanical shock as do bomb blasts and the many other forms of shock which affect buildings, automobiles, and the human body.

SHOCK

Bombs, collisions, and tornadoes make mechanical shock a problem of major concern to mankind

By WILLIAM H. HOPPMANN, II

HUMPTY DUMPTY, the nursery rhyme character, is one's earliest introduction to a large and newly-recognized engineering problem. The fragile creature fell from a wall with such a sharp blow on a hard road that all the king's men and horses were unable to unscramble him. Replace Humpty by any kind of structure and the fall by any severe blow upon that structure, and one has an illustration of the phenomenon known as mechanical shock.

So broad is the field affected by mechanical shock that the problem has significance for most engineers and even for medical men. The word *shock* is used as describing an intense force applied for a relatively short time to any structure, such as a bomb blast striking a building, a blow falling on a man's skull, or the jolting of shipping crates in a railroad freight car. The word *structure* is intended to describe a very general class of objects which includes machines, buildings, bridges, motor vehicles, ships, planes, towers, and the human body. Various technical committees have struggled and are still struggling with definitions in this field of knowledge, so no more precise definition will be attempted here.

In examining any specific structure to assess the effects of mechanical shock, three major questions arise. Will the structure become damaged by a given shock? Can damage be prevented by a change of design? And, if the object (such as the human body) cannot be redesigned, can the structure be protected from the full intensity of the shock?

THE problems of mechanical shock arose gradually in the history of technology. The importance of the subject in any technical sense probably goes back only to the great industrial movement of the middle of the nineteenth century which

Text continued on page 9

Dr. Hoppmann is Associate Professor of Mechanical Engineering at Johns Hopkins.

UNITED PRESS PHOTO

A famous case of shock by wind was the destruction of Washington's Tacoma Narrows Bridge in 1940. This remarkable picture was made seconds after a section of the center span was ripped loose.

POST-DISPATCH PICTURE, BLACK STAR

Mighty forces assail man and his works

These are familiar examples of mechanical shock

◄ A tornado tore off two walls of this Illinois home.

Water-hammer, being tested above, damages home and industrial hydraulic systems.

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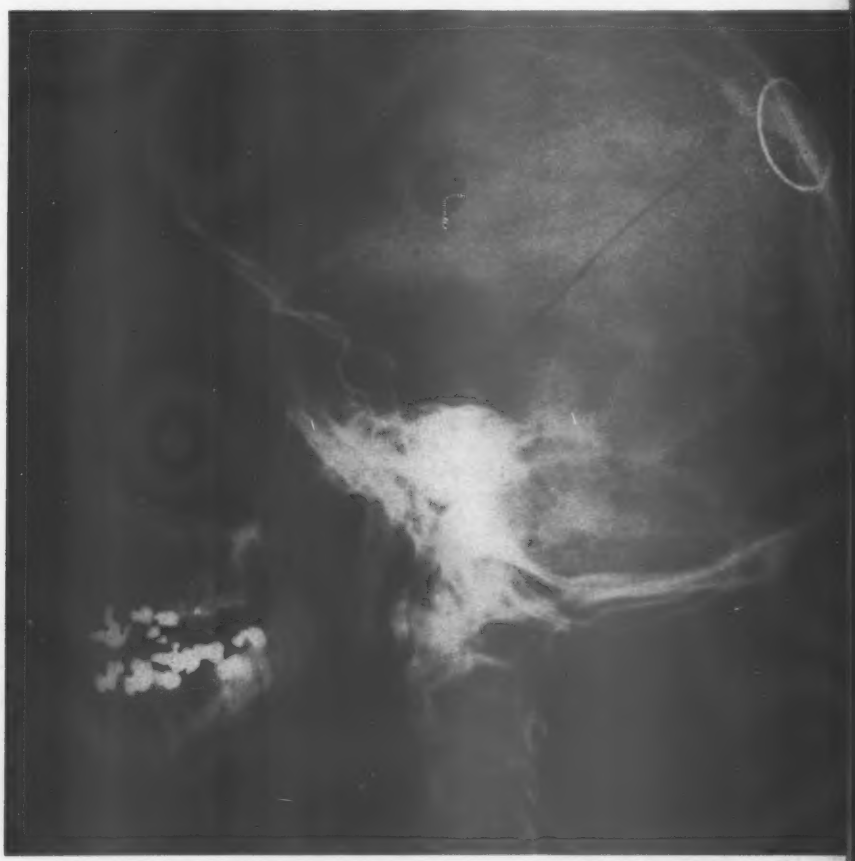
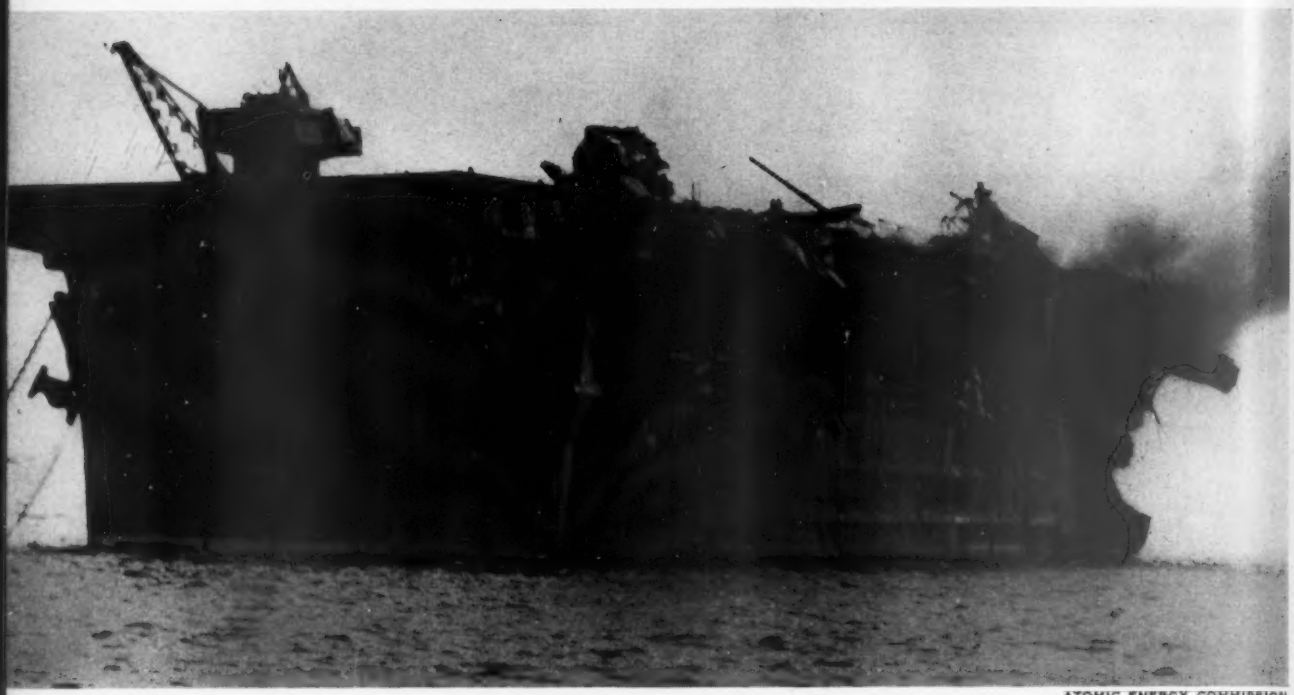
Storm waves battered the breach in this heavy sea wall on the English coast.



A blow may severely damage the human skull. A clinical x-ray (*right*) shows a fracture extending from the back of the head where the blow fell (white circle marks point of impact) around to the left ear. Automobile collisions, falls, and other concussions produce these often-fatal injuries.

WAYNE UNIVERSITY



ATOMIC ENERGY COMMISSION

Shock, in the form of an atomic blast a half-mile away, did this damage to the carrier *Independence* at Bikini.

OFFICIAL PHOTOGRAPH, U. S. NAVY

Ships must be built to withstand both natural and man-made shocks. A mine did this to the DD-551.

Man-made shocks often outdo nature's

ATOMIC ENERGY COMMISSION

Developing structures which can withstand enormous shocks, such as those created by bomb explosions, is one problem which engineers must face today. The steel-frame building at the right was 1,800 feet from "ground zero," the point of explosion of an A-bomb. Its corrugated iron roof and wall sheathing were stripped by the blast, which also crushed concrete.

saw so much construction and general engineering development have their start.

The main stream of events, however, goes back no more than a dozen years. The term shock was used a great deal and attained its special meaning at the beginning of World War II. In the present article it is modified to mechanical shock in order to distinguish it from the word as used in other fields.

The subject of mechanical shock is important in its serious implication for the national defense as well as for the national economy. The whole intriguing story of the people who are helping in the solution of its many problems cannot be given here. And indeed attention to the problems is of such recent origin that there are relatively few accomplishments to report. The vast field is wide open to research, and an increasing number of people will be needed before the problems can be provided with solutions.

Protection against shock is essential when rockets and guided missiles are equipped with delicate equipment which must withstand strains at takeoff and in flight. At right is instrumentation for a rocket designed at Johns Hopkins Applied Physics Laboratory.

JOHNS HOPKINS • APL

SOME of the commonplace examples of shock arise from natural phenomena, the movement of wind and water. In their most intense form—hurricanes, tidal waves, earthquakes—they represent unusual or even rare forces to which structures are subjected, sometimes with disastrous results. Buildings are wrecked by earthquake. Ships are broken in two by gigantic waves, like those in the Christmas storm which split one freighter and mortally damaged the *Flying Enterprise*. Bridges as large as the Tacoma Narrows Bridge (*see photograph, Page 6*) are torn away by strong winds.

Man has himself devised some disturbances which at times rival natural ones in ferocity. These surely include atomic explosions which give rise to severe radiation of heat as well as winds of high pressure. The catastrophic levelling of Hiroshima and Nagasaki is well-known. Much smaller in effect but also characterized by lethal punch are aerial bomb bursts and underwater explosions which send both buildings and ships to their destruction.

Not so dramatic but equally important on a large scale are shocks to vehicles running over bumps in the road, to rockets launched into space and to pilots of planes abruptly catapulted into the air, to pipes carrying liquids when valves are rapidly closed. The latter type of shock is called waterhammer and is well-known to many householders who at some time have rapidly closed a quick-acting valve on water flowing from a pipe. A banging noise sometimes results because of the quick stoppage of the moving water. The liquid being nearly incompressible, a severe pressure wave runs through it from the faucet. The condition can cause damage.

THE devastating effects of atomic bomb explosions are described in a handbook entitled "The Effects of Atomic Weapons," published by the U. S. Government Printing Office. It can be seen in this book that while destruction of structures is complete very near to the exploded bomb, damage decreases fairly rapidly with distance from it and at distances of several miles disappears entirely.

Men of science created this enormously lethal bomb; they are now faced with the problem of providing protection from its released energy. Structures of all kinds must be designed and built to protect us from such catastrophic heat and pressure. The designs depend on knowledge of pressures caused by the explosion as well as the resistances of structures and materials themselves. This is indeed a challenging field for the engineer and scientist.

A close second to the A-bomb in dramatic impact is the proximity fuze which during World War II enabled the military to score important victories both in Europe and in the Pacific. The story of the radio proximity fuze, known as the "VT" fuze, is one of the glories of American technical development.

In the "VT" type artillery shell, the fuze itself operates as a miniature radio station placed in the nose of the shell. When the missile is fired from a gun, the radio begins to send a continuous signal. As the shell approaches its target, the radio signal is reflected from the target and received back at the fuze. When the shell reaches a certain predetermined distance from the target, the reflected radio waves cause the shell to explode.

THE basic components of the proximity fuze are miniature "rugged" vacuum tubes, a small battery, and safety devices to prevent premature operation. One of the most critical problems in the development of the fuze was to protect this sensitive radio station against the

Continued on Page 25

The light from hundreds of fireflies shines from a vacuum jar at Johns Hopkins, where the insects are used in energy research. As air is removed from the jar, the normally intermittent flashing of the bugs turns into a bright, steady glow.

Operation Firefly

Nocturnal insects are helping science to learn how all living things—including man—function

Photographs for The Johns Hopkins Magazine by Werner Wolff, Black Star

THIS is the month when fireflies, missing from North America since last summer, will begin to blink their lights again on this continent. They will appear first in the South, where the warmth of spring is most attractive to them; later in the North, where temperatures will not be right until June. Wherever they appear, they will excite the imaginations of small boys and girls (who will feel an irresistible urge to capture some in bottles) and of adults as well, some of whom may write poems about them and a handful of whom, working in laboratories, know that the firefly may hold the key to certain vital mysteries in which all forms of life on earth are still veiled.

Dr. William D. McElroy and 300,000 fireflies, part of a year's supply.

Men have been fascinated by fireflies for centuries. As early as 1526, Spanish writers told of seeing beetles in the West Indies which looked like shooting stars as they flew—insects with lights so bright that natives used them as candles and, fastened to the feet, as lanterns to light their paths at night. In Japan, fireflies have come to be so highly regarded that dealers raise and sell them commercially. School children have honored their emperor by releasing thousands of the bugs in front of the Imperial Palace in Tokyo. Firefly festivals are held and important persons, including General Douglas MacArthur, have received cagefuls as a token of Japanese respect.

Fireflies are not the only natural producers of light by which men have long been intrigued. Aristotle mentions the light of dead fish and flesh. Aristotle and Pliny speak of the light from damp wood. Explorers have marveled at the phosphorescence of the sea, and men have been awed by luminous dusts from volcanoes and the pale blue flame which sometimes plays over marshes and swamps.

The curiosity of scientists, too, has been stirred by nature's lights. They have found that in the animal kingdom alone, at least forty orders have forms which produce light. They know that this light is efficiently "cold": unlike that produced by fire or electricity, it wastes little of its energy in making heat. But how do animals create light? The question has puzzled scientists for years.

Recently they have begun to get the answer, a bit at a time. As it has emerged from their studies, so has an important fact which has far-reaching implications: the way in which animals make light is essentially the same process by which all living things convert the chemical energy they receive from food into useful forms. To know how this process takes place would be to know how all animal life—including man—functions.

To such secrets, the firefly is now providing the clue. In studies at Johns Hopkins, nearly half a million of the insects each year are helping in an intensive search which has begun to yield tremendously important results. It has already uncovered what seems to be the key substance which enables all animals, including humans, to use energy in their life processes. It is a compound called adenosine triphosphate (ATP for short), present in all living things.

Now the problem is to determine *how* this vital process takes place—a problem on which, as the photographs on the following pages show, Hopkins scientists (with the help of fireflies and a corps of Baltimore children who gather them by the netful) are hard at work.

From insects dried in vacuum desiccator (*Page 10*), boys remove tails which contain the fireflies' light-making lanterns.

Knowledge comes from firefly tails

By preparing hundreds of firefly tails a day during the busy spring and summer season, the boys at the left are helping Dr. William D. McElroy, associate professor of biology at Johns Hopkins, determine how the firefly makes his light. For Dr. McElroy's research depends on a steady supply of the insects, a supply which he builds up in warm weather and keeps in a biology-department freezer for use in this laboratory all year.

It was discovered in 1885 that the firefly's lantern contains two substances: luciferin, a heat-stable, easily oxidizable compound, and luciferase, an enzyme which accelerates its oxidation. By the process pictured on the next two pages, Dr. McElroy has succeeded in obtaining luciferin from his hundreds of firefly tails and partially purifying it; by a similar process he has isolated luciferase.

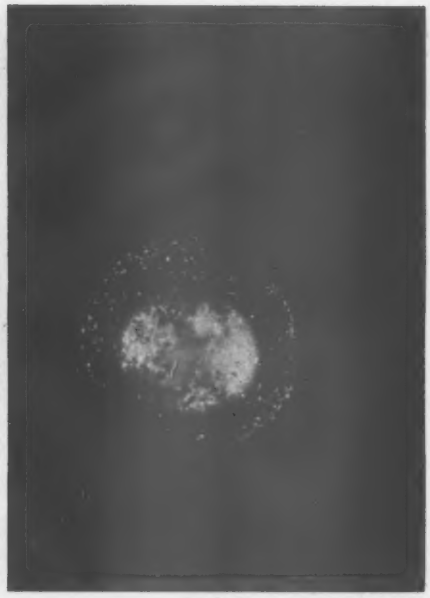
When luciferin and luciferase are put together, there is a flash of light. Until very recently, however, scientists were unable to explain how, in the firefly, light is produced over and over again. They knew that other factors, in addition to luciferin and luciferase, must be at work; but what they are was unknown.

When Dr. McElroy isolated luciferin and luciferase, he was finally in a position (*Page 15*) to find out.

◀ Pressure between fingers separates tails from bodies.

Firefly tails are first ground to a fine powder.

A water extract is made of the ground-up material.



In dark, mortar and pestle glow with firefly light.

◀ From crude extract (*above*), component substances are separated. *Left*, acidity of the fluid is adjusted.

Next step is to remove ▶ insoluble debris. *Right*, mixture is weighed out into centrifuge tubes.

Insoluble matter is spun from mixture in cream separator. ▶

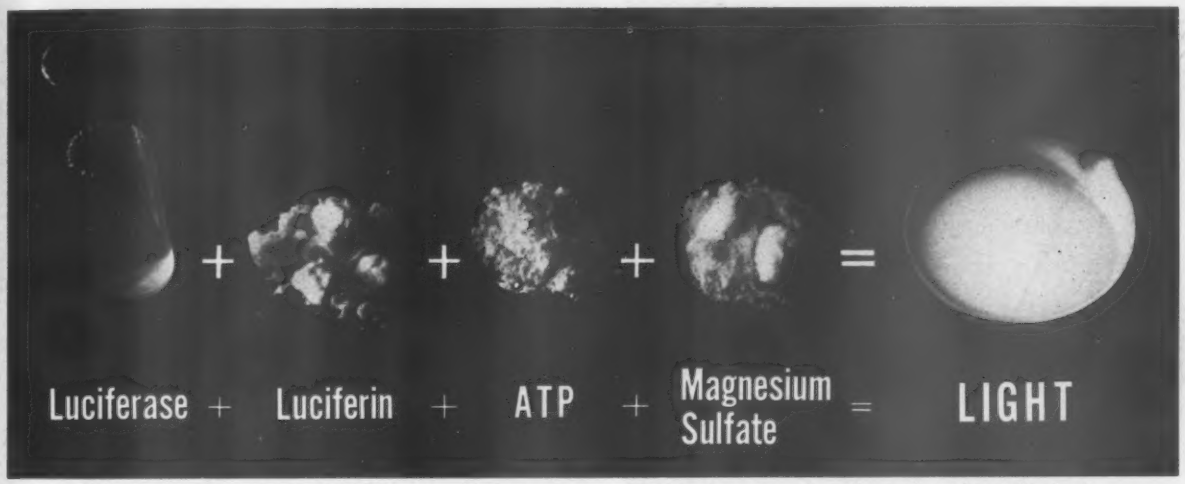
Debris removed in the centrifuge (*preceding page*) is reground with water and then put in cellophane tubings, along with the original water extract.

Tubes are put in jar of water. Luciferin, one of light-making substances in firefly lantern, diffuses through cellophane, into the water.

After twenty-four hours, water is evaporated to small volume. This crude luciferin solution is purified on an ion exchange column (*above*).

Solution is again evaporated and put on second column, which takes more impurities from luciferin. Luciferin glows (*above*) in ultraviolet light.

The key substance in energy conversion is ATP



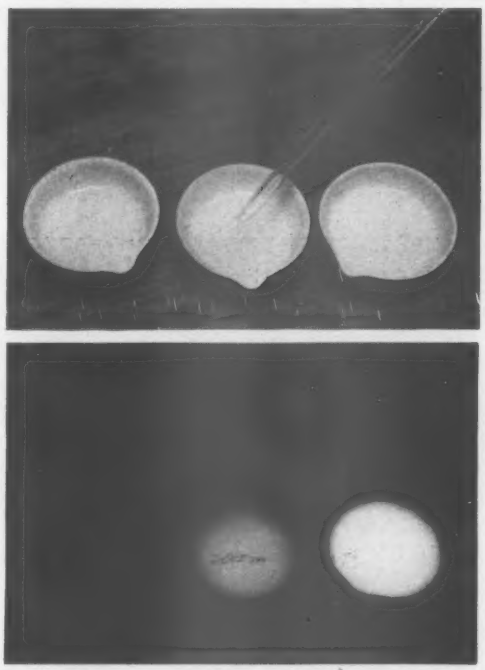
This is the action which Dr. McElroy and his associates at Hopkins have found produces the light of the firefly.

In his Hopkins research, Dr. McElroy has uncovered a highly significant fact: the energy source for the firefly's light is the same as that which enables all animals to do work.

Plants convert light energy—which they obtain from the sun—into chemical energy. When animals consume plants, they release this chemical energy during metabolism. But in order to be able to use it for useful purposes, animals must store this released energy somewhere and be able to draw upon it as they need it in performing work.

The storage-place is a complex phosphorous-containing compound called adenosine triphosphate—ATP. It is found in all animals. With its hoard of energy, ATP is transferred to the various parts of the body where energy is needed. In man, ATP is the source of energy for walking, talking, thinking, and other vital processes. In the firefly, it is essential as the energy source for the insect's light-emitting system.

In discovering this, Dr. McElroy has opened up further questions, which now for the first time it may be possible to answer. How is the chemical energy of ATP transferred into other forms of energy—into mechanical energy in man's muscles, into light energy in the luciferin of the firefly's lantern? By obtaining luciferin from the firefly (*opposite page*) and duplicating the light-making process, Dr. McElroy hopes to find out.



In each dish is same solution of luciferase, luciferin, and magnesium but (*left to right*) increasing amounts of ATP. The more ATP, the more light.

On a warm spring evening, children chase fireflies for use in research.

Eight-year-old Mary McElroy spots a winking bug in a Hopkins wood.

The kids help

To gather the thousands of fireflies needed in his work, Dr. McElroy has enlisted the services of scores of Baltimore children—including his own daughter (*above*), who has proved herself an enthusiastic fireflycatcher. Since the fireflies must be alive when turned in, Dr. McElroy and his colleagues keep their laboratory open late on summer evenings to receive them. But some children have hit upon an even handier scheme: they store them in their family refrigerators—not always to their parents' delight.

◀ Firefly chasers sign up for nets at a Hopkins laboratory.

Like an elfin dancer, Mary goes after the firefly with her net.

From behind a tree, Mary spies another flash. She creeps up on it carefully.

At evening's end, children bring in catch, for which they are paid (*next page*).

The sale of fireflies is serious business. Boy hands in his supply.

With help of researcher, he empties bugs into bottle for counting.

He waits tensely for pay, adds it solemnly (*right*).

Catching bugs is profitable fun at Hopkins

For many youngsters, firefly-catching for science has become a big business, a ready source of summer spending-money. Dr. McElroy pays twenty-five cents for every hundred living insects turned in. One enterprising Baltimore boy hired a group of friends to do his catching for him (at lower rates than that paid by Johns Hopkins) and collected more than 27,000 in one season. He sold them to Hopkins and pocketed the difference for services rendered, which consisted mainly of storing the bugs in his mother's icebox and transporting them to Dr. McElroy's laboratory once or twice a week.

Last summer (when the pictures on these pages were made) nearly half a million bugs were collected. They have supplied the raw materials for Dr. McElroy's studies during the past winter, and this spring he expects to announce that he is again in the market for fireflies to replenish his stock. If he does, the Hopkins campus will again echo to the shouts of youngsters on the trail of the elusive insects, spending money will jingle in the pockets of the successful, and neighborhood Coke machines will enjoy a minor boom.

◀ Champion Jimmy Tracy caught over $60 worth of bugs last year.

Glaucoma

In a sense, it is "plumbing trouble" within the eye—second only to cataracts in frequency of occurrence and seriousness of its effects on vision

NEXT to cataract, glaucoma is the most important disease of the eye in terms of frequency of occurrence and seriousness of its effects on vision. Glaucoma is the condition in which the fluid pressure within the eye is abnormally high.

Under normal conditions fluid is constantly pumped into the eye from the blood vessels that pass through it, and fluid constantly leaks out of the eye through a minute set of drainage channels called the canal of Schlemm, connected with and draining into small veins on the outside of the eyeball. An elaborate—and as yet incompletely understood—set of control mechanisms operates normally to keep the intraocular fluid pressure at its normal level.

If the outflow channels get obstructed, the pressure within the eye rises above the normal level. This is glaucoma; and in this sense, glaucoma is plumbing trouble in the eye. Glaucoma is not related to high blood pressure as might be thought likely, for when the control mechanisms are working normally, even marked rises in blood pressure produce only minimal and transitory rises in intraocular pressure; while if the controls are not in proper order, the pressure in the eye can rise even if the blood pressure is normal.

Research in this field has a fascination not merely in relation to its importance to vision, but also because the attempt to unravel this delicate and complex mechanism leads one into some of the most recondite problems of general physiology. The delicate checks and balances which normally control the level of fluid pressure in the eye are an example in miniature of those checks and balances which operate to keep an almost constant internal environment in the organism as a whole, and which are required for the smoother functioning of all of our organs.

Though very much remains to be found out about the mechanisms of fluid transport within the eye, basic research in this field has been extraordinarily productive during the last two decades. Investigators in many different institutions and in many different countries have pooled their efforts in the attack on this problem. Before recounting their results, however, it must be made clear why some pressure in the eye is normally required, why the eye if felt gently through the closed lids feels tense and firm in comparison to the flesh.

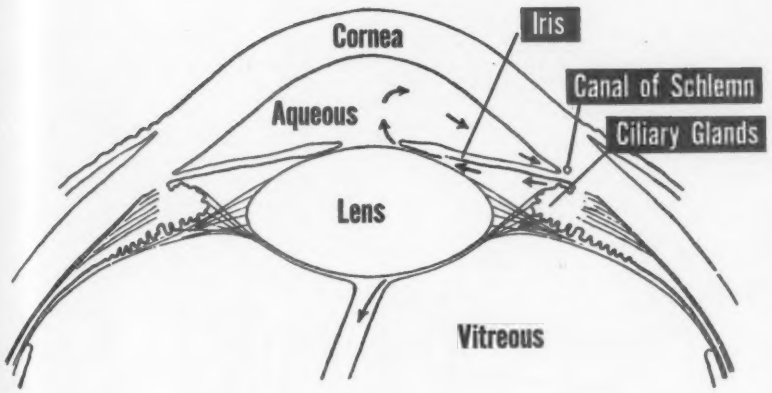
IF the pressure in the eye were very low, the eyeball would be indented and distorted by the weight of the lids, and the refraction of the eye would change with every blink. Normal vision requires that the pressure in the eye should be at least sufficient to keep the shape of the eyeball undistorted.

It took a very long time to prove that watery fluid constantly was being pumped into and was leaking out of the eyeball, that the control of the intraocular pressure consisted in a dynamic, not a static system. After extensive studies the source of the fluid was traced to the ciliary body, a small ring-shaped structure lying behind the iris and close to its outer margin. The ciliary body is covered on its inner surface by a group of vascular tufts which constitute the organ of intraocular fluid secretion.

One group of investigators has concentrated its efforts on the problem of how the fluid is transported from the blood capillaries through the tissue of the ciliary processes and into the intraocular cavity. The secretion of fluid is a common characteristic of many organs. The stomach, the salivary glands, the liver, and many other organs secrete their characteristic juices. It is interesting that a satisfactory physical theory of fluid transport was first worked out on the tiny organ in the eye, and that analogies to the intraocular mechanism are now beginning to appear in the study of other secretory organs.

A second group of investigators has been concerned with the transport of dissolved substances from the blood plasma to the intraocular fluid. Many substances injected into the blood stream of animals appear in the intraocular fluid. The rate at which such substances accumulate and disappear from the fluid of the eye casts light on the rate of fluid transport within this organ; it is also of interest to the general physiologist as an example of how nourishment travels from the blood across the

This article was prepared for The Johns Hopkins Magazine by a physician who prefers to remain anonymous. A companion article, on cataracts, appeared in the April issue.



Under normal conditions, as the arrows on this drawing indicate, fluid is constantly pumped into the eye and constantly leaks out of the eye through a minute set of drainage channels called the canal of Schlemm. An elaborate set of control mechanisms normally keeps the intraocular fluid pressure at normal level. If the outflow channels get obstructed, pressure within the eye rises above normal level. This is glaucoma.

walls of the capillaries to the various organs of the body.

Recently it has become possible to inject into the blood of human beings small amounts of non-toxic fluorescent materials, and to record by optical instruments the appearance and disappearance of such minute traces of substances in the fluid of the eye. By these methods it is possible to gain information as to the rate of flow of the intraocular fluid in both normal and glaucomatous eyes, and to gauge and analyze the effects of various therapeutic procedures performed in the treatment of glaucoma.

While we do not as yet understand the full complexity of the mechanism of intraocular fluid transport, the reliability of various therapeutic procedures, both medical and surgical, has been well tested by meticulous clinical research, and there is a constant increase in the armamentarium available to the clinician faced with the care of patients suffering from glaucoma.

GLAUCOMA usually develops in late middle life but occasional cases occur in infancy, due to a failure in the embryonic development of the outflow channels. Until recently the outlook for preservation of vision in the affected infants was very gloomy, only a small percentage responding favorably to medical or surgical treatment. Recently it has been found that a very simple operation can be performed on these infants' eyes with a surprisingly high percentage of cures.

In this instance, empyrical knowledge has outrun basic science; for the theory on the basis of which this simple operation was devised has been found incorrect, and we are in the intellectually unhappy but therapeutically happy state of knowing how to cure these babies without knowing why the operation works successfully. The same operation is ineffective on adult glaucoma, and the type of operation successful on adults has been found highly unsuccessful on infants. Presumably the simple and successful procedure in some not-yet-understood fashion stimulates the tissues in the infants' eyes to develop the outflow channels that were lacking.

In the adult, glaucoma can often be controlled by medical treatment, chiefly in the form of eye drops. A variety of drugs have long been known to lower the pressure in glaucomatous eyes. The effective agents belong to a large family of drugs that stimulate the parasympathetic nervous system. Among their general pharmacologic effects is the dilatation of capillaries and small arterioles. Presumably, therefore, they promote the opening of partially clogged drainage channels and thus facilitate the outflow of the intraocular fluid. The study of how these drugs operate appears to be within the range of analysis of currently available clinical and laboratory procedures, and much new light in this field is to be expected in the near future.

In the meantime, the pharmacological chemists have learned some of the secrets of the chemical structure necessary for these drugs to be effective and hence are able to make a large variety of analogous compounds, some of which are proving more effective than the natural alkaloids extractable from plants that were first found useful. One of the most effective of these newer compounds was initially developed by the Chemical Warfare Service in its search for toxic substances, a circumstance which illustrates how closely allied are all the fields of biologic research.

Those cases of glaucoma in which medical treatment is incompletely effective require operation, for if the intraocular pressure remains for long periods above the normal level, irreparable damage is done to the retina and optic nerve. The surgical procedures are designed to produce a new drainage channel through which fluid can leave the eye and be reabsorbed into the blood vessels of the loose tissues outside the globe. In a large percentage of cases these operations succeed in permanently curing the glaucoma, or at least in bringing the pressure down to a level at which it can be controlled by medical treatment.

The combination of empyrical knowledge—that certain drugs and operations are beneficial even though we do not fully understand how or why they are beneficial—and the large, rapidly expanding, but still incomplete basic knowledge of normal and diseased physiologic mechanisms, together with the close linkage of investigative work in this field with that in other branches of biologic science, all illustrate in miniature the excitement, efficacy, and high promise of modern medical research.

NEWS at Johns Hopkins

A digest of developments at the University and Hospital in recent weeks

A full round of activities—including class reunions, campus tours, a luncheon, and a parade of classes at the Hopkins-Maryland lacrosse game, has been planned for the Annual Alumni Homecoming on Saturday, May 17. Classes of years ending in 2 and 7 have scheduled reunion dinners and parties, and Hopkins fraternities will hold open house for their alumni.

The activities will actually get under way the night before, when the Johns Hopkins Engineers hold their annual dinner in Levering Hall at 7 p m. Assembly will be in the Aeronautics Building at 6. Guest of honor at the dinner will be John T. Rettaliata, who received his B.E. in 1932 and his Dr. Eng. in 1936 and who has recently been named president of the Illinois Institute of Technology.

The same evening, the Class of 1922 will have cocktails and buffet supper at Elkridge Kennels at 6 p.m., and the Class of 1927 will have cocktails and buffet supper (with wives invited) at the ROTC Building on the Homewood campus at 6 p.m.

Here is the May 17 timetable:

11 A.M.—Guided tours of the Homewood campus, beginning at Levering Hall.

12 NOON—Buffet luncheon for alumni at Homewood Gymnasium; tickets, at two dollars per person, may be ordered from the Alumni Relations Office.

1:30 P.M.—Parade of classes, forming in the gymnasium and marching to reserved seats at Homewood Field.

2:30 P.M.—Lacrosse game, Johns Hopkins vs. the University of Maryland, Homewood Field.

5 P.M.—Open house for alumni at Johns Hopkins fraternities.

6 P.M.—Reunion dinners:

1902: Johns Hopkins Club.
1907: Johns Hopkins Club.
1912: Place to be announced.
1917: Johns Hopkins Club.
1922: Dinner-dance (7 p.m.) at Levering Hall.
1927: Dinner-dance (7 p.m.) at Levering Hall.
1932: Blackstone Dining Room.
1937: Park Plaza Hotel.
1942: Stafford Hotel.
1947: University Club.

BOOKS

Francis J. Haas, g. '20–'21 (Pol. Econ.): *Man and Society* (second edition, revised).

William Stewart Halsted, late professor of surgery: *Surgical Papers*, 2 vols. (Republished by the Johns Hopkins Press.)

George J. Heuer: *Dr. Halsted* (Johns Hopkins Press).

George John, g. '48–'51 (Writing): *A Garland About Me.*

Donald D. King, research scientist, ICR: *Measurements at Centimeter Wavelength.*

William D. McElroy, associate professor of biology and director of McCollum-Pratt Institute, and H. Bentley Glass, associate professor of biology, editors: *Phosphorus Metabolism*, Vol. I, A Symposium on the Role of Phosphorus in the Metabolism of Plants and Animals (Johns Hopkins Press).

Adolf Meyer, late professor of psychiatry: *Collected Papers*, Vol. IV, Mental Hygiene; ed. by E. Winters (Johns Hopkins Press).

James Morfit Mullen, B.A. '99: *Let Justice Be Done.*

James J. Nickson, M.D. '40: *Symposium on Radiobiology*, The Basic Aspects of Radiation Effects on Living Systems.

Lynn Poole, director of public relations: *Today's Science and You.*

THE FACULTY AND STAFF

● AMONG THE MEMBERS OF THE BOARDS OF TRUSTEES, Congressman Christian A. Herter has announced his candidacy for the Massachusetts governorship.

Sidney Lansburgh has been reelected to the national executive committee of the American Jewish Committee.

● IN THE SCHOOL OF ADVANCED INTERNATIONAL STUDIES, Wilhelmina E. Carothers has been appointed librarian.

● IN THE SCHOOL OF HYGIENE AND PUBLIC HEALTH, Harry Stoll Mustard has been named visiting professor of public health administration for the coming academic year.

Dean W. Roberts, lecturer in public health administration, has been appointed director of the Commission on Chronic Illness.

Perry F. Prather, lecturer in public health administration, has been named deputy director of the Maryland State Health Department, replacing Dr. Roberts.

● IN THE FACULTY OF PHILOSOPHY, Richard H. Howland, assistant professor and chairman of the department of art, has been appointed director of the Society of Architectural Historians.

Nathan O. Kaplan has been promoted to associate professor of biology.

Frederic Lilge has been named visiting professor of education for the coming academic year.

Joseph W. Beach has been appointed visiting professor of English, the appointment to take effect in July.

Georges Poulet has been named professor of French.

A. C. Waters will take the post of professor of geology in July.

Ludwig Edelstein has been named professor of humanistic studies.

William L. Straus, Jr., will become professor of physical anthropology in July.

● AT THE HOSPITAL, Edwin L. Crosby has resigned as director to become the first director of the new Joint Commission on the Accreditation of Hospitals. Designed to rate United States and Canadian hospitals on administration, policies, and medical education, the accrediting commission was organized by

◀ *New surgery building now under construction at Johns Hopkins Hospital* JACK ENGEMAN

the American Medical Association, the American Hospital Association, the American College of Surgeons, the American College of Physicians, and the Canadian Medical Association.

W. Arthur Purdum, chief pharmacist, has been appointed to a central consulting committee on pharmacy training programs of the Veterans Administration. The committee has been established to help alleviate the growing shortage of trained pharmacists in the hospital field.

● In the School of Engineering, Abel Wolman, professor of sanitary engineering, has been given the Harry E. Jordon Achievement Award for "distinguished service outside the line of duty." Awarded by the American Water Works Association, the citation described Dr. Wolman's work in planning the development of water resources for the Republic of Israel.

Harold Hoelscher has been appointed assistant professor of chemical engineering for the next academic year.

George S. Benton has been promoted to associate professor of civil engineering, the appointment to take effect this summer.

John L. Artley has been named assistant professor of electrical engineering for the next academic year.

Sidney Davidson will take the post of assistant professor of accounting in industrial engineering this summer.

Acheson J. Duncan, formerly of the School of Business, has been named associate professor of statistics in industrial engineering.

● In the School of Medicine, Eleanor A. Bliss, assistant professor of preventive medicine, will leave Hopkins to become dean of the Bryn Mawr College Graduate School.

William F. Rienhoff, Jr., associate professor of surgery, recently served one month in Manila as honorary head of the department of surgery, College of Medicine, University of the Philippines.

Arthur B. Otis has been made associate professor of surgery and associate professor of physiology.

● At the Applied Physics Laboratory, new members of the staff include Robert L. Echols, of the dynamics and analysis group; Isadore Katz, guidance group physicist; Stuart D. Gilchrist, engineer; James E. Stewart, associate engineer; James H. Frame, mathematical assistant with the dynamics and analysis group; Robert M. Moyerman, of the research center; W. Boswell Childs, of the patents group; William C. Caywood, engineer; Duncan B. Phillips, of the legal group; Robert T. Kroll, of the solid propellant information agency; Charles Blackburn, associate engineer; Glenn F. Engen, telemetering group engineer; Harlan H. Knapp, Jr., engineering assistant; and Robert J. Dentz, artist in the illustrations group.

Henry H. Porter, head of "Bumblebee" operations, is in the Far East serving as Operations Evaluation Group representative on the staff of the Commander of Naval Forces.

DEATHS

(*Dates are 1952, unless otherwise noted.*)

Louis H. Armstrong, B.A. '33, April 3.

Naomi Beser, B.S. '45, g. '44–'45 (Educ.), March 31.

Paul Kirk Brown, '50–'52 (Med.), March 10.

William Hepburn Buckler, g. '03–'04 (Pol. Econ.), Trustee of the University '04–'13, LL.D. (hon.), '40, March 2.

Bernard Jacob Cherry, B.A. '36, December 12, 1951.

Elias Earle Cooley, fac. '28–'34 (Mil. Sci. & Tac.), '31–'34 (Med.), February 18.

Maurice Fels, B.A. '83, March 8.

Douglas Sewell Frantz, '23–'25 (Arts), March 21.

Flora Alma Guggenheimer, g. '22–'23 (Pl. Physiol.), March 6.

James B. Holmes, M.D. '12, fac. '13–'15, March 5.

Jacob S. Jammer, B.S. in Eng. '18, March 16.

Louis Joseph Kroll, B.A. '32, February 28.

Joseph Levy, M.A. '23 (Zool.), M.D. '27, February 29.

Ralph Stayner Lillie, '06–'07 (Physiol.), March 19.

Edward Garfield Mahin, Ph.D.'08, February 4.

Andrew C. McLaughlin, g. '96–'99 (Geol.), January 6.

Mark Charles Miegel, '49–'52 (Arts), February 23.

Philip Sidney Morgan, '96–'98 (Arts), April 1.

Margaret Ruth Royston, '47–'52 (McCoy), February 10.

Francis Edgar Sparks, B.A. '93, Ph.D. '96 (Hist.), March 27.

William Ross Thomson, '90–92 (Arts), March 18.

C. Burnet Torsch, B.A. '96, March 1.

Maner Lawton Wade, Ph.D '31 (Chem.), August 19, 1951.

THE ALUMNI

Homer P. Little, Ph.D. '10 (Geol.), was to be honored last month with a weekend of ceremonies at Clark University, celebrating his thirtieth anniversary as dean of the university.

Janet Howell Clark (Mrs. Admont H.), M.A. '12, Ph.D. '13 (physics), fac. '17–'38, will retire this June as dean of the College for Women, University of Rochester.

Lynn W. Meekins, B.A. '13, has been named director of the Malayan Tin Bureau, an information center established in Washington by Malayan tin producers.

George Marshall Lyon, M.D. '20, has been appointed assistant chief medical director of the Veterans Administration. He had been directing the agency's radioisotope research program.

Tracy J. Putnam, fac. '20–'21 (Pathol.), has been appointed honorary chairman of the Medical Advisory Board of the National Multiple Sclerosis Society. He had been chairman of the board.

Arthur C. Bushey, Jr., '22–'23, has been named assistant supervisor of shipbuilding, naval inspector of ordnance, and executive officer for the industrial manager activities of the Norfolk Naval Shipyard in Baltimore.

E. Dwight Barnett, '23–'24 (Med.), has been named director of the new Institute of Administrative Medicine of the College of Physicians and Surgeons, Columbia University.

J. Allen Scott, Sc.D. in Hyg. '27, fac. '27–'29, has been appointed to the Expert Advisory Panel on Parasitic Diseases of the World Health Organization. Dr. Scott is professor of statistics and epidemiology and director of the Laboratory of Helminth Research at the University of Texas.

J. Wallace Joyce, B.E. '28, Ph.D. '31 (Elec. Eng.), g. '31–'32 (Geol.), represented the U. S. government as an observer at the British Commonwealth Scientific Official Conference in Australia. The conference was aimed at facilitating liaison between American and Commonwealth scientists. Dr. Joyce is an engineer with the U. S. Navy Bureau of Aeronautics.

Clifford P. Lyons, Ph.D. '32 (Engl.), fac. '32–'36, has been named dean of the College of Arts and Sciences of the University of North Carolina.

Lawton A. Burrows, Ph.D. '34 (Chem.), has been named general technical director of the textile fibers department at E. I. du Pont de Nemours & Co.

George Gamow, fac. '34–'35 (Physics), will go to Japan this month for a three-week lecture tour. Invited by a Tokyo newspaper, Dr. Gamow will join J. B. Priestley, Leon Jouhaux, and

Eleanor Roosevelt as participants in the Japanese Peace Treaty celebrations.

H. Hayward Dinneen, B.E. '35, has been promoted to the post of chief engineer of the Rust Furnace Company.

C. Beaumont Wicks, Ph.D. '35 (Rom. Lang.), has been decorated by the French government with the Palmes Académiques, signifying the title Officier d'Académie. Dr. Wicks is head of the department of Romance languages at the University of Alabama.

William LeRoy Fleming, fac. '37–'39 (Med.), is professor and chairman of the department of preventive medicine at the University of North Carolina School of Medicine.

Merel H. Harmel, B.A. '38, M.D. '43, fac. '45–'47, has been appointed professor and head of the department of anesthesiology at the State University College of Medicine in New York City.

Calvin B. Spencer, '39–'40 (Hyg.), has been appointed chief of the Division of Foreign Quarantine, U. S. Public Health Service.

Herbert Michael Bosch, M.P.H. '40, is professor of public health engineering at the University of Minnesota School of Public Health.

H. LeRoy Scharon, M.A. '43, Ph.D. '47 (Geol.), has been named chairman of the mining, geology, and geophysics division of the American Institute of Mining and Metallurgical Engineers.

Ralph L. Engle, Jr., M.D. '45, has been named assistant professor of medicine at Cornell University. His wife, Mary Allen Engle, M.D. '45, fac. '46–'48, has been appointed director of Premature Institutes, a postgraduate program at Cornell.

Mechanical Shock

Continued from page 9

tremendous jolt produced when the shell was fired from a gun. The ruggedization of the tubes was an important part of the gigantic overall project for putting fuzed shells into the field.

This is the aspect of the problem concerned with mechanical shock. A host of persons contributed, but L. G. Hector, R. D. Mindlin, and H. Selvidge may be mentioned for their substantial contributions to make the fuze withstand the large forces to which the shell is subjected by the gun. A great deal of the scientific development of the "VT" fuze was accomplished at the Applied Physics Laboratory of the Johns Hopkins University.

The "VT" fuzed shell put new life into the Navy because, before its advent, airplane attack had been threatening to annihilate naval fleets. On shipboard the fuze was used in 5-inch antiaircraft projectiles. Although it was designed originally for Navy use, the fuze is credited with playing a major role in stopping the now famous German counter-offensive in the Ardennes. On December 16, 1944, the first day of the Battle of the Bulge, the U. S. Army began to use the "VT" fuzed antiaircraft projectiles, and by December 18 the use was extended to field artillery.

Currently, a related shock problem arises in connection with experiments with guided missiles. In addition to the problem of designing a missile to withstand take-off forces, there is the additional requirement of protecting a large quantity of delicate instruments used to measure physical variables incidental to the flight, as well as those associated with the upper atmosphere. The desired data are radioed back to receiving stations on the ground. It is clear that all of the equipment as well as the missile itself must be made shock resistant.

An extensive program of study of mechanical shock was initiated and developed by the U. S. Navy in its own laboratories during World War II. For many years prior to the war it was known of course that great shocks resulted from underwater explosion of mines and torpedoes. As a consequence, much experimental work had been done to strengthen the hulls of fighting ships.

However, it was not fully realized to what great extent electronics would dominate the design of the major offensive as well as defensive features of a ship in the period beginning about 1940. Nor was it realized how extensively a near bomb explosion might knock out these sensitive electronic devices. Even if mines or torpedoes exploded near or against naval vessels, it was important not only to keep afloat but also to preserve the fire control equipment for the guns, communications, and the other delicate gear needed to fight.

In order to obtain useful shock design information for literally thousands of different kinds of equipment, it was imperative to develop shock simulation tests. The result was that various kinds of shock testing machines were designed and built to approximate the shock conditions that might occur in service. While it may be obvious that the problem of obtaining the required test conditions is exceedingly difficult, it can be fairly said that the program was attended by considerable success. The tests provided data of a statistical nature and also on many occasions revealed specific weaknesses of design not noticed in the designing stage. Electrical gear, for example, often would be entirely satisfactory under normal operation but would be broken by severe shock. Clearly it is not enough for a battleship's equipment to function properly during the calm service which it may expect for most of its years; it must also be able to stand up under the bombs which may someday hit it. Probably one of the greatest benefits of the testing program was the development of more critical attitudes concerning design for shock resistance and an increase in understanding of the problems involved.

Mechanical shock often arises in connection with transportation and shipping. Dangerous forces frequently develop when vehicles are driven over rough roads or when collisions occur. The Armed Forces have studied the problem of shipping delicate equipment by truck. In particular, the U. S. Army Signal Corps has done extensive work in trying to determine shock characteristics encountered in transportation by motor vehicle. Some of the results of these investigations have led to satisfactory specifications for packaging electronic equipment to be shipped from source of supply to ultimate destination.

The railroads constitute one of the larger common carriers for materials and equipment. They are deeply interested in mechanical shock because of the great losses sustained in shipping material during times of both war and peace. It has been reported that damage claims paid by American railroads exceed one hundred million dollars a year, and that the annual packaging cost for goods transported by railroads exceeds one billion dollars. Here clearly is an important relation of the shock problem to the national economy. Some have called this the problem of "package cushioning."

One of the principal causes of damage is that cars are frequently moving too fast when they are coupled in switching operations. It is very difficult for operators to obtain the relatively safe speed of four miles per hour for coupling.

As a consequence, the impacts are so severe that they often cause major damage to the merchandise in transit.

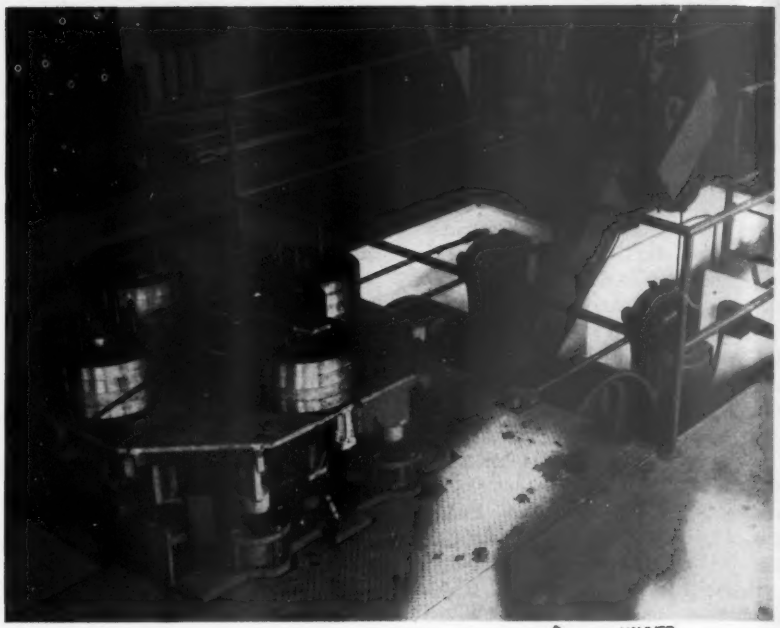
This problem also arises in the case of merchandise carried by ships and planes and the motor vehicles previously mentioned. The railroads now conduct a large amount of research with the purpose of reducing the enormous annual losses. Here rests another great challenge for engineers and scientists.

Almost important structure which is subjected at times to mechanical shock is the human body. In time of peace, automobile collisions are unfortunately commonplace. In time of war, crash landings of planes result in fractured skulls, artillery bursts knock out men as well as buildings. During World War II, the British discovered that seamen were being put out of action with fractured feet and ankles caused by explosions of mines and torpedoes under the sterns of their ships. In many other ways the human body is frequently subject to mechanical shock.

The problem is to protect the body and reduce the shock directly imposed upon it to a point it can withstand. Crash helmets and safety belts are among the protective devices now in use. It is important in this work to know the response characteristics of the human body and its parts to various kinds of mechanical shock. This is especially important for the skull. A great deal of thought is being given to the subject by medical men in collaboration with other scientists. Some very interesting and provocative work on the skull subject to impact has been performed at Wayne University in recent years.

Work on body response to shock is being conducted in the laboratories of other universities, the government, and industry. This kind of investigation includes physiological effects on humans, such as those induced by forces incidental to pulling an airplane out of a steep dive. "Blackout" is among the effects sometimes caused by the large deceleration associated with such maneuvers.

It is fairly evident that scientists studying the problems of mechanical shock and research men from the medical field can prevent and alleviate damage by cooperation on this large class of problems. For instance, it would seem important for a medical man to have a proper understanding of the mechanical strains impressed on a human body by forces arising from shock. Certainly it is important for the designer of vehicles to know about these things if he is going to be able to properly cushion passengers.



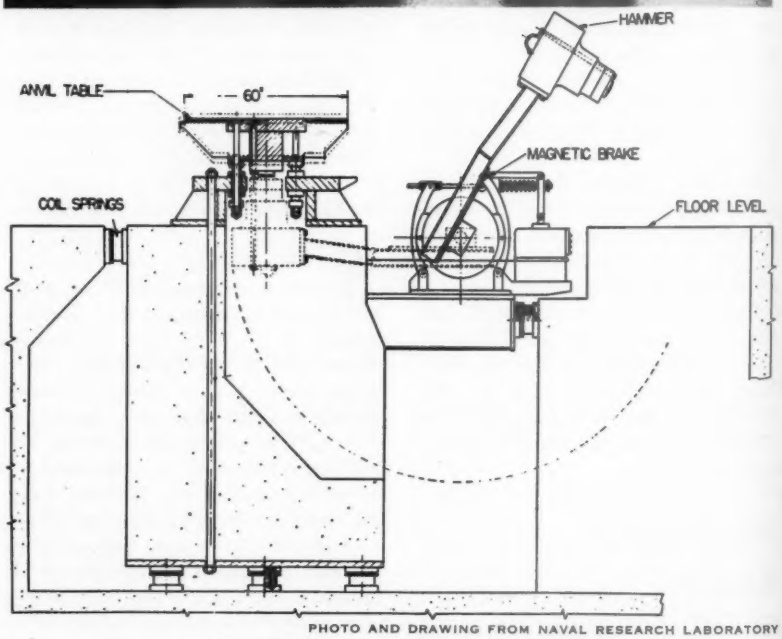


PHOTO AND DRAWING FROM NAVAL RESEARCH LABORATORY

To test equipment for its ability to withstand shocks, the U. S. Navy uses this enormous machine. Photograph at top shows hammer which, as the chart illustrates, swings in a great arc and smashes anvil table on which engineers place equipment which is being tested. Delicate instruments measure intensity of shock.

The thread running through all of the foregoing examples is clear. Some kind of structure is subjected to intense forces or accelerations for a relatively short period of time. This condition usually results from collision, as in the case of automobile accidents, or by severe motion of foundations of the structure, as in the case of earthquakes.

Narrow compartmentation of knowledge is inimical to the most efficient attack on problems of mechanical shock. Boundary lines between the sciences must be crossed, and obsolete compartmentation of engineering into

old-line divisions must be ignored. A common viewpoint must be developed. The features common to all shock problems must be studied regardless of the areas in which they arise.

The greatest attempt in this task of unification of effort has been accomplished under the auspices of the Research and Development Board of the Department of Defense. Dr. Elias Klein, of the Naval Research Laboratory, has been principally responsible for the success of this program which originated under the sponsorship of the Navy. Many well-attended symposia on all phases of the problem of mechanical shock have been conducted throughout the country since the end of World War II. The technical papers presented at these symposia are published in bulletin form and represent a large reservoir of knowledge on the subject.

It is unfortunate that most of these bulletins must be classified for security reasons. An outstanding exception is the bulletin of the sixteenth symposium, held in October, 1950, at the Armour Research Foundation of the Illinois Institute of Technology. The main theme of that symposium was protection of material and equipment shipped by common carrier.

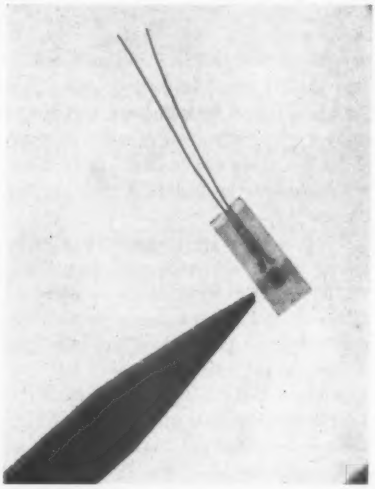
For success in solving the many thorny problems of mechanical shock, the great theoretical work in mechanics of the past must be properly assimilated for use and greatly extended. While the theoretical contributions of eminent scientists like L. Euler, Bernoulli, J. Lagrange, Lord Rayleigh, I. Newton, H. Lamb, and A. E. H. Love have been of great value in attacking the problem of dynamical resistance of structures, there remain a tremendous number of theoretical problems which must be solved. Mathematical techniques are becoming increasingly available for easing the difficulties in the path.

Just as important as the need for theory is the need for good experimentation. Just instrumentation is a critical part of this job, and great hope may be taken from the achievement in the field of strain gauges. Early it was apparent that it was essential to have a small, light, and tough gauge with which to measure strain on the various parts of structures subjected to dynamic loads. About 1940 such a tiny strain gauge was produced and successfully developed. It enjoys a very important place in the field of dynamic testing today.

Commercially, this gadget is designated the SR-4 strain gauge; scientifically, it is called an electrical resistance wire gauge. It is essentially a fine wire one thousandth of an inch thick (about as thick as a human hair) laid out in parallel continuous folds and attached to a piece of felt-covered paper. The whole thing measures no more than an inch and a half long by three-eighths of an inch wide. In application, this gauge is cemented to the structure under investigation, and appropriate electrical leads are attached to the small terminal wires of the gauge. They are then led to electronic amplifiers which connect with a cathode ray oscilloscope from which pictures may be made of the strain patterns.

Many other problems of an experimental nature must be solved with the same degree of satisfaction. Simulation shock machines and test stands for investigating the dynamic response of structures must be developed and continuously improved. Service data are an important need in the work.

Most important for success in solving the problems of mechanical shock is an effective program of research and study in the universities and technical schools. Some sharp changes from the traditional training in engineering are necessary. There must be a unified view on the problems of dynamics and especially of the dynamic resistances of structures.



An electrical resistance wire gauge, which is essentially a fine wire of about the thickness of a human hair laid out in parallel continuous folds and attached to a piece of felt-covered paper, is used to measure strain on the various parts of structures subjected to strains.

While there may still be need for the compartmental-type engineers of the past—like the civil, mechanical, electrical—there must be recognized the keen need for highly trained men who will cross boundary lines and who are prepared and oriented in such a fashion that skull fracture is just as impelling a problem to them as is the fracture of a gusset plate in a bridge.

Their allegiance is principally to the field of applied mechanics. It is their duty to supply advanced knowledge of theoretical as well as of experimental nature. The future in this field of endeavor will then be bright. Real accomplishments will follow.

The New Authoritarianism

Continued from page 3

newspaper as saying something so stupid that I wondered what condition of body and mind I could have been in when I said it. We all, I suppose, say stupid things from time to time, and the mere fact that the words were stupid did not surprise me. The style was, however, so different from my usual mode of expression and the idea so contrary to what I believe, that I was curious to learn what the source of the quotation might be.

By correspondence I found that the newspaper had bought the entire editorial from a service in Pennsylvania which presumably sells canned opinions to newspaper editors throughout the country. Now no great harm was done to me by this editorial, though I have no way of knowing how many newspapers throughout the country bought it, but the fact that editors buy their opinions readymade was somewhat startling. We know of course that writers on a variety of subjects sell their columns to syndicates which resell them to newspapers, but such articles contain at least a nucleus of news, news flavored to be sure by opinion.

Editorials, however, are supposed to be something different. They usually contain judgments of right and wrong, are critical in their purpose, represent (it is usually believed) the philosophy of the paper's staff. But here we find that a group of people settled in one state actually provides the judgments, the criticisms of right and wrong, the philosophy all readymade for others. The editor has nothing to say in the

matter at all. He buys his opinions all expressed as one might buy a suit of clothes by mail. How simple a matter it would be for a few powerful people to form an editorial service of this sort and actually determine the judgments of right and wrong, of truth and falsity, of good and bad for the people as a whole.

But not only is opinion sold over the counter; so is news. All news is selected out of the total mass of events which occur from day to day. This is inevitable. No one has the time or the interest to read about everything which happens. The job of an editor is precisely to determine what news he thinks worth printing and what is not worth printing. Some papers specialize in some sorts of news—crime, scandal, personalities, education, foreign affairs, finance; others try to cover pretty nearly everything. This cannot be helped, even if there is any reason to change the system. One does not expect the five- and ten-cent stores to carry imported luxuries, nor the comics to discuss Aristotle's *Metaphysics*.

But the standardization of news stories through syndicated columns and radio programs of commentators is something different; for if twenty or thirty papers carry the same column, the readers of twenty or thirty papers are all reading the same version of the same event. And if twenty million people get their impression of the news from the way it is presented by their favorite radio commentator, they too are bound to be influenced by what they hear, and they cannot hear both sides of the story. Certain writers and radio commentators become authoritative sources for what has happened in the world.

There are very few columnists and commentators who ever say, "This is the way I see it, but on the other hand, my opponents say . . ." Their programs would begin to seem flat and stale if they did. For unfortunately people want to have the answers, not the questions, and, by force of listening to the answers only, they have forgotten, if they ever knew, precisely what the questions were.

The standardization of news and opinion would not be permitted if the people at large were not so hardened to it that they no longer objected. But they have got used to the idea that there are experts in opinions and in the selection of news, just as there are experts in chemistry, physics, and medicine.

If you happen to live in a city like Baltimore with a newspaper which actually makes a determined effort to present several aspects of a question, while maintaining its own editorial opinion, you find the standardization of news in other parts of the country somewhat shocking. What is shocking about it is the placidity of the readers and listeners, or their indifference, for I do not pretend to know which it is.

Independence of judgment is an absolute essential if democratic government is to continue, for the democratic form of government is decision by discussion, not by the imposition of judgments from above. But discussion becomes a mockery if each side first listens to a radio commentator and then hands out his opinions and his selection of the facts as if he had discovered them for himself.

This habit of mind is precisely what accounts for the sudden shifts in opinion which occur in this country. Whether it is a question of presidential elections, graft in government, the drug menace, juvenile crime, or atheism in universities, the public has become accustomed to taking its facts and its opinions from men and women who seem to realize that the public memory is short and who have neither fear of self-contradiction nor responsibility to the truth.

This placidity is symbolized in popular speech in such phrases as "I don't mean to criticize but . . ." as if criticism were in itself something shameful whereas it is one's duty in a democracy. One should want to criticize, to judge for oneself, and to make one's opinions known when it will serve some purpose to do so. Does anyone believe that his fellows are so perfect that they do not deserve criticism?

There are, to be sure, ways of criticizing which are base and disgusting. Attacks on irrelevant issues, on personal traits which have nothing to do with the question in hand, what logicians call *argumenta ad hominem*, would fall into that class. But on the other hand if the people once become afraid of criticizing their representatives, they might just as well have an absolute monarch over them to tell them what to do and what not to do. And that would seem to be exactly what such people want. You will recall the voices a few years ago who would have preferred a Hitler or a Mussolini in the White House to *That Man*. Such people are afraid of their responsibilities as citizens of a free country and are the same men who abdicated in Italy and Germany; for it must not be forgotten that both Mussolini and Hitler preserved the outer aspects of Legality. They are the same people who will not stick their necks out, see no sense in always fussing over principle, who just want to be let alone, who won't soil their hands in political waters.

We have been well prepared for all this intellectual humility by certain of our educators. The elective system of Mr. Eliot was devised for a society of free men who knew what they wanted to study and who could be tested for their aptitude in making their choice. Most universities at one time or another adopted some of its features. But it did not take long for some people to point out that this might lead to a hodgepodge of learning which would omit the greatest that had been thought and said.

If one selects, however, a group of books from the past which are supposed to contain all the knowledge which is worth having, one runs into the danger of believing that certain individuals in the past discovered final truth once and for all, whereas each of them was an innovator in his day and age and what he discovered was what was wrong. Neither Plato, nor Aristotle, nor Lucretius, nor St. Augustine, nor St. Thomas, nor St. Bonaventura, nor Galileo, nor Newton, nor Descartes, among those who figure on such lists, was a man who simply handed down the tradition of his fathers. Each saw new problems and changed tradition. The people who carried on the old tradition were people like Martianus Capella, Solinus, Prosper of Aquitania, the followers, the editors, the lexicographers, the encyclopedists, most of whom are known only to the more highly specialized historians.

The notion of a tightly knit curriculum, containing the supposedly best books, is a notion which will do well in a cloistered society where innovation is heresy, but it just will not work in a society living in time and conscious of actual problems. Its proponents are either ignorant of intellectual history or willfully desirous of producing a disciplined society with both orthodoxy and heterodoxy sharply defined.

But such people are gradually getting the upper hand in the United States as may be seen by the growing attacks on recalcitrant individuals, on freedom of thought, and on what is wrongly called the confusion of the intellectuals. The recalcitrant individual is the artist, the

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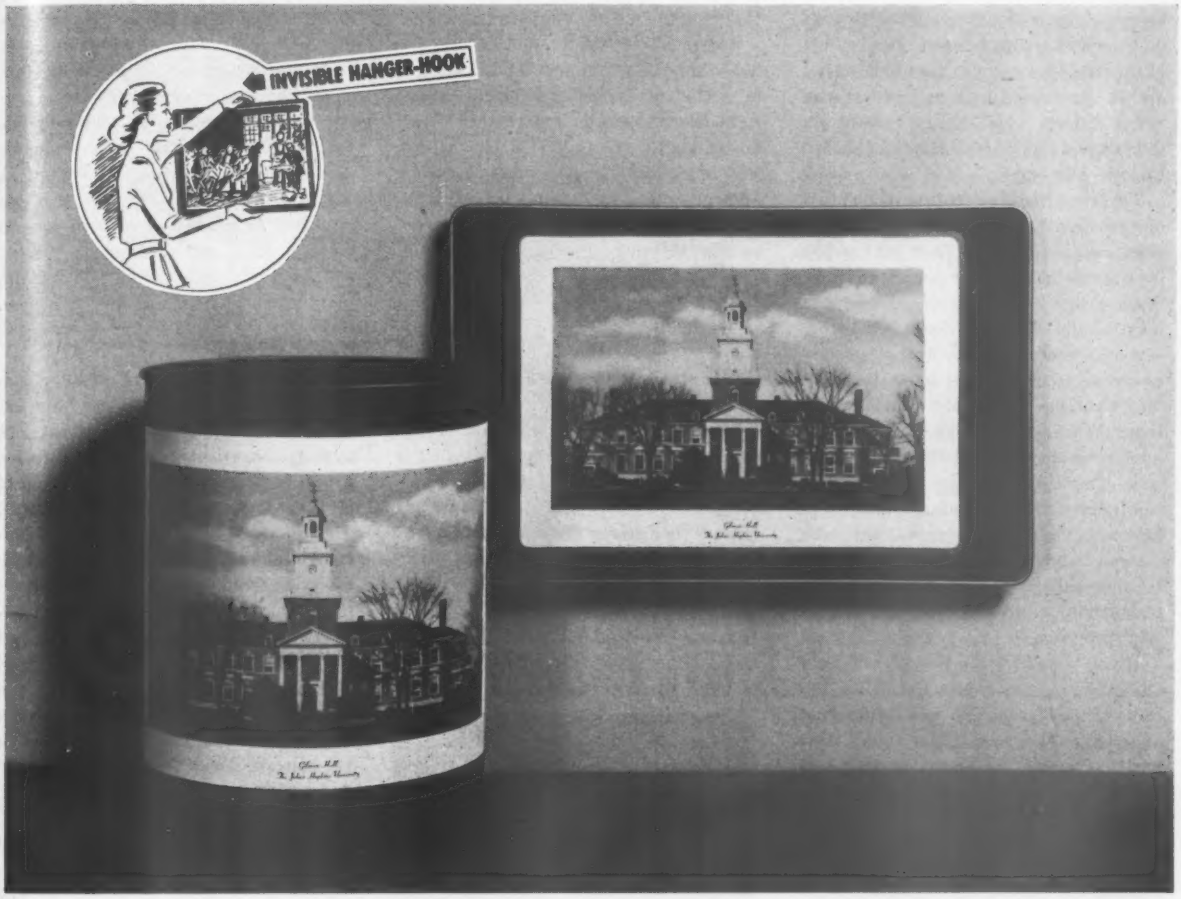

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scientist, the reformer, the philosopher, the religious leader. Abraham, Moses, and the Prophets were recalcitrant individuals, dissatisfied with things as they were. One looks in vain in the New Testament for any evidence that its principal figures were struggling to pass on the Old Law unchanged. The history of the arts, the sciences, and philosophy are all punctuated with individuals who saw problems which their predecessors did not see and who attempted to solve them in new ways.

The most striking feature of any list of the Best Books which I have ever examined is that each later author has been a rebel against the dominant traditions of his time. But of course such lists usually stop at a date well before our own times and we are not usually aware of precisely what harm to tradition was done by the men who figure on them. What progress has been made by human beings either in the fields of science, simple knowing, or in the field of the betterment of human conditions, in increasing human happiness, has been due not to fidelity to tradition but rather to the willingness of people to suffer martyrdom if need be for the sake of such progress.

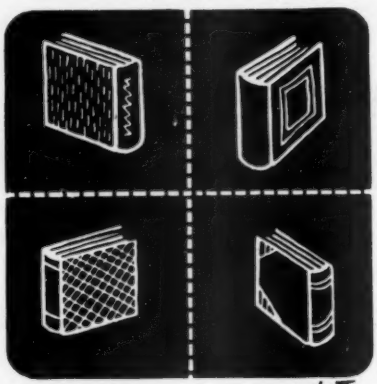
If you were living in the days of early Christianity, you would have seen the same kind of confusion and intellectual anarchy as you hear about today. But what is called confusion is the outspokenness of recalcitrant individuals. When they are dead, then they are spoken of as heroes and prophets. But while they are alive, they are noncooperative, radical, and heretical.

THOSE of us who modestly attempt to contribute to the enlightment of our fellows, who try our best to solve genuine problems, and not merely to repeat the solutions of the past, who are actually able to say "No" when "Yes" would be treachery to our conscience and to our intelligence, are now labeled traitors or, at the mildest, disturbers of the peace. But no man who is faithful to his job as a teacher or as one engaged in research has the right to say "Yes" on all occasions. We are engaged in the search for truth and in its dissemination.

Unfortunately the truth hurts. It hurts the feelings of everyone whose pet ideas it contradicts. Some of these ideas are sacred. Some have the prestige of tradition. Some are merely the ideas of men who hold positions of power in society. No one likes to have his ideas superseded, even when they are merely a matter of what to eat and what to wear. I have heard people become as emotional over the fact that undergraduates do not wear neckties as they would be over treason. People have been burned at the stake for maintaining that the universe was infinite in extent.

The result is that those of us who are less stubborn in our convictions engage in a kind of hypocrisy which is downright disgusting. One man testifies that he no longer subscribes to the *Nation* but buys it at a newsstand. Another apologizes to his butcher because he finds the price of beef too high for his purse, prefacing his comment with the remark, "I am not a Communist, but . . ." A third gives away his album of Paul Robeson records lest his friends think him subversive. A fourth takes an earlier streetcar to work lest he be overheard engaging in political discussions with his office-mates who might say something suspect. But such has always been the state of mind of people in times of panic. Overtly they conform, but within themselves they are as unconvinced as ever.

IF one thinks about these things, the trends which they exemplify, the state of mind which prompts them, one can-



not deny that the philosophy of authoritarianism is abroad in the land. The protestant, with a small *p*, is out of step. One must conform, agree, goose-step, chant hymns to Order, Discipline, Tradition.

It is not to be denied that there is a genuine need for authority in some regions of life. No one would be so silly as to maintain that a government could fulfill its functions if it did not have authority. It must have the power not merely to make decisions but also to execute them. In a democracy, it is undeniably the duty of everyone to obey the government once the decisions have been made. When one does not approve of a law, as most people in the East did not approve of the Volstead Act, the sensible thing to do is not to violate it but to work for its repeal. Though I personally think that loyalty oaths are stupid, being inefficacious in demanding that a person declare himself innocent of acts of which he has never been indicted, and in most of their forms an unwarranted trespass on a person's private life, nevertheless if one were passed in my state and applied to all people, I should consider it inexcusable to refuse to take it. Granted that we need government, armies, and the law, they must possess a kind of authority which is unquestioned. They all change, to be sure, but there are orderly ways of changing them.

In science too there are certain acquisitions which we call facts or laws and which it would be nonsense to attempt to deny. No scientist would be bothered to verify for himself all of the laws of physics or chemistry or mathematics. To do so would be like a person's verifying tide-tables, or the phases of the moon as given on a calendar, or a telephone number.

We accept certain facts as established and we use them as if they were final. But at the same time we also maintain that they are on trial and can always be set aside when they turn out not to be well grounded. Thus the Ptolemaic system of astronomy could be accepted, if one wished, as we do accept it in common speech when we speak of the sun crossing the sky or rising and setting. But in spite of its prestige, when it turned out to be better—that is, simpler—to accept the Copernican system, scientists discarded the older arrangement as no longer satisfactory.

The progress of science is due above all to the scientists' willingness to consider all authorities as on trial. They serve until they are superannuated. Their proponents must submit to dethronement at any time regardless of their status as great authorities. What authorities say in science is not true because they are authorities, but they are authorities because what they say is true.

THERE is thus admittedly a need for authority in government, in the military establishment, in science, and indeed in everyday life. But the kind of authoritarianism which is now becoming popular is simply excessive. If the sciences were complete and everything knowable

Dr. Pendleton In Siam

FAO PHOTO

The photograph above shows Dr. Robert L. Pendleton (*at right side of desk*) professor of tropical soils and agriculture at the Isaiah Bowman School of Geography at Johns Hopkins, in Siam, where he has served with the Special Technical and Economic Mission to that country. Observed the Bangkok *Standard* recently: "He has rendered conspicuous service to this country through his researches and experiments with local soils, which will have an advantageous effect on the nation's food production. Moreover, he and his wife have won the love of all the Siamese they have come across. It would be no exaggeration to say that they are two of the most loved Americans who have ever lived in this country.... It is people like the Pendletons who have won so much esteem here for America and have contributed so well to Siamese-American cooperation."

were known, then all that scientists would find to busy themselves with would be tidying up the corners. If everything is known, as St. Thomas Aquinas seemed to think it was in the thirteenth century, then how silly it would be to try to discover something new.

But if you believe that there are still some truths to be discovered, it is just as silly to expect some authority to tell you the answers to what no one understands. Are there frontiers to knowledge or are there not? My point of view, like that of most university professors, is that there are.

There is no book or set of books to which we can turn for the answers to many questions about the mechanism of evolution, of heredity, of learning, of the relation of the individual to his environment. We know a great deal more than our fathers knew about diseases and their cure; but any pathologist would admit that there is more of which we are ignorant than there is of what we know. Again, take the case of psychology. What do we really know at present about the springs of behavior, of why the human race behaves as it does, of the influence of fear on action, of the difference between the behavior of individuals in isolation and in groups?

In fact, there are so many *terrae incognitae* to be explored that one is amazed that anyone should think he was more than a child standing in wonder at the sight of a flower or a star. Authority is helpless here, for there are no authorities in unexplored fields of learning. To say this is to state a tautology.

Not only are there enormous unexplored areas of science, there is always the challenge of novelty to plague us. It is all very well to say that human nature is always and everywhere the same. The truth is that in all essential matters it differs. We are all biological specimens to be sure, all being born and dying and eating and working. But every society that we know anything of controls and determines the way in which its members are born and die and eat and work.

Moreover, populations grow, new instruments of production and distribution are developed, members of foreign societies enter our society, the very physical environment changes through floods, erosion, the exhaustion of the soil, the creation of new land as in the Low Countries, and the old ways of meeting the situation will no longer work. Men must adjust to the changes, and innovation takes the place of tradition.

When one looks over the cultural history of the Occident, one comes to the conclusion that it is an uneasy balance between what one might call resignation and rebellion on the part of individuals, between custom and improvisation on the part of social groups. Such cultural revolutions as the introduction of Christianity, the Reformation, the French Revolution, the Industrial Revolution, the introduction of gunpowder, the invention of printing, the discovery of the Western Hemisphere, the development of laboratory and experimental science, the elaboration of statistical techniques in thinking, all were responsible for the death of some things and for the birth of others.

There have been societies which have sought to prevent change. The Wall of China has become a symbol of such a society. No one could get out, no one could get in, and by keeping the people in a cloister, it was hoped that a maximum of stability would be achieved. Contemporary Russia seems to be turning into such a cloistered society. Obviously if a man does not know that there are any alternatives to his way of living, he will be resigned.

But the Western World is not so cloistered. All attempts to prevent change have been frustrated. Such attempts have been made by academies in the arts and letters and even in the sciences, but they have come to nothing. Thus authority has given way in all fields except in certain religions, though even there growth has taken place.

The Constitution of the United States is a document which probably has lasted longer than any other similar document. And yet it too has had amendments and its articles have been submitted to interpretation by the courts and thus been modified from the beginning of its history to the present. The New Authoritarians do not like this state of affairs. They overlook the hard fact that the document itself provides a means for amendment. The history of statute law in general illustrates the stupidity of thinking that a western society can survive without serious changes in its very heart. New things occur and the law has to be reinterpreted to fit them or new laws have to be written to control them. Who is so bold as to say that sheep-stealing should still be a capital

THE MONTH
at Johns Hopkins
A calendar of events: April 28—May 31

VARSITY SPORTS

LACROSSE—Johns Hopkins vs. Navy, Sat., May 10 (away); Maryland, Sat., May 17 (Homewood, 2:30 p.m.); Mt. Washington, Sat., May 24 (away).

BASEBALL—Johns Hopkins vs. Maryland, Tues., Apr. 29 (away); Towson, Thurs., May 1 (Homewood, 3 p.m.); Western Maryland, Sat., May 3 (away); Catholic, Wed., May 7 (Homewood, 3 p.m.); American, Fri., May 9 (away); Loyola, Wed., May 14 (away); Western Maryland, Sat., May 17 (Homewood, 2:30 p.m.).

TRACK—Johns Hopkins vs. Gettysburg, Wed., Apr. 30 (Homewood, 3:30 p.m.); Swarthmore, Sat., May 3 (away); Loyola, Tues., May 6 (away); Mason-Dixon Tournament, Fri. & Sat., May 9–10 (Homewood); Middle Atlantics, Fri. & Sat., May 16–17 (away).

TENNIS—Johns Hopkins vs. Maryland, Wed., Apr. 30 (away); Catholic, Sat., May 3 (away); Towson, Tues. May 6 (away); Western Maryland, Wed., May 7 (Homewood, 3 p.m.); Washington, Sat., May 10 (away); Loyola, Thurs., May 15 (Homewood, 3 p.m.); Championships, Sat., May 17.

GOLF—Johns Hopkins vs. Franklin & Marshall, Mon., Apr. 28 (Mt. Pleasant Golf Course, 1:30 p.m.); Gettysburg, Wed., May 7 (away); Juniata, Fri., May 9 (away); Invitational, Sat., May 10 (away); Mason-Dixon Tournament, Mon., May 12; Delaware, Wed., May 14 (away); Western Maryland Invitational, Sat., May 17.

ALUMNI MEETINGS

ANNUAL ALUMNI HOMECOMING—Sat., May 17. See Page 23 for schedule.

CLASS REUNIONS—see Page 23.

JOHNS HOPKINS ENGINEERS—Annual dinner, Fri., May 16. Assembly 6 p.m., Aeronautics Building; dinner 7 p.m., Levering Hall. Guest of honor: John T. Rettaliata, B. E. '32, Dr. Eng. '36, newly elected president of Illinois Institute of Technology. Reservations, $3 per person, from Alumni Relations Office, the Johns Hopkins University, Baltimore 18, Md.

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DRAMA

THIRD ANNUAL CONFERENCE ON DRAMA IN THE SCHOOLS—Sat., May 3; Levering Hall. Sponsored by McCoy College and the Department of Writing, Speech, and Drama.

THE BLUE BIRD (Maeterlinck)—Sat., May 17, curtain 10:30 a.m. & 3 p.m.; Baltimore Museum of Art. Presented by the Children's Educational Theater.

MEDICAL MEETINGS

ALPHA OMEGA ALPHA LECTURE—Fri., May 2, 5 p.m.; Hurd Hall. Speaker: Dr. Merrill Sosman, Peter Bent Brigham Hospital.

COLLEGE OF AMERICAN PATHOLOGISTS, MIDDLE-EASTERN SECTION—Tues. & Wed., May 6–7, 9 a.m.–5 p.m.; Hurd Hall.

CARDIOVASCULAR SEMINAR—Mon., May 12, 5 p.m.; Hurd Hall. Speaker: Dr. Harold Burn, professor of pharmacology, Oxford University. "Noradrenaline and Amine Oxidase."

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Continued from Page 31

offense or that the rule of primogeniture should still obtain or that popular government should give way to absolute monarchy or that women should lose the right to vote or that primitive communism should be reinstituted or, for that matter, that people should live in caves and hunt with bows and arrows?

This is, of course, a purely rhetorical question. But the New Authoritarians will not face it, and they act as if the answer were affirmative rather than negative. Universities are the places where new problems arise and where a serious attempt is made to answer them. In society in general, tradition takes care of things and we coast along by the inertia of custom. But to answer new questions by old solutions is like trying to do chemistry in terms of alchemy and medicine in terms of magic. Unless we assume that all problems have been both raised and answered, there must be some people who have society's permission to perceive and answer the new problems.

It is right here that the New Authoritarians step in and are at their most vicious. For they know well enough that if there actually are some new problems, there may be also new answers, and that will prove extremely upsetting to the settled modes of life. Hence professors are the pet targets of such people, for if you can silence the professors, you will have been pretty effective in keeping the rest of society in ignorance. The dictators learned this very early in their careers. In Fascist Italy and Nazi Germany, in Stalinist Russia, political power took the place of free inquiry. Truth became the prerogative of the government. Authority took the place of reason, and intellectual discipline took the place of academic freedom.

There is no doubt that the authoritarians are right in seeing in the teaching body the greatest enemy to tradition as such. No professor worth his salt will teach as if he were inspired by supernatural powers and as if his say-so were final and incontrovertible. We are all committed to the doctrine that our truths are on trial and must constantly be re-submitted to examination. If they cannot meet the test, they must go. Nor is free enquiry a respecter of persons or of dogma. The people who practice it are human gadflies. But they are also the nerve of civilization, and the moment that nerve is cut, civilization perishes.

NEXT MONTH

Professors at America's colleges and universities, almost everybody agrees carry a heavy part of the responsibility for the development of our leaders of tomorrow. A recent survey, in fact, brought out the fact that college professors are regarded by the "man in the street" as seventh in prestige from the top of a list of ninety occupations ranging from Justice of the U. S. Supreme Court to shoe-shine boy. But how do college professors make out economically? Recently Dr. Clarence D. Long, professor of economics at Johns Hopkins, completed a comprehensive study of this question. His findings appear in an article next month. Look for it in the June issue of

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